ATTACHMENT I – UZ Data and Associated Data Tracking Numbers (DTNs)

I.1 Available Site Data

This section summarizes the data used in the UZ Flow and Transport PMR. The input data represent the current understanding of UZ flow and transport processes. Tables are presented to summarize the different data reviewed, analyzed, and developed in associated Analysis/Model Reports (AMRs). Some data sets are used in multiple analyses. The discussions associated with the tables cross-reference the relationships among data sets and AMRs. The details of analysis and modeling are given in individual AMRs and in Section 3. It should be noted that this Attachment is only intended to give the main data sets and the associated DTNs for the unsaturated zone, and is therefore not necessarily complete.

I.2 Geologic Data

The major inputs and outputs of the CRWMS M&O (2000, U0000), *Development of Numerical Grids for UZ Flow and Modeling*, are summarized in Table I-1 (with outputs presented in *italic*).

Table I-1. Geologic Data for the UZ Model

Data Description	DTN or ACC
Geologic Framework Model, GFM3.1	MO9901MWDGFM31.000
Integrated Site Model, ISM3.0	MO9901MWDISMRP.000 MO9901MWDISMMM.000 MO9804MWDGFM03.001
Repository layout configuration	MOL.19990409.001
Mesh files for model calibrations, CRWMS M&O 2000, U0000	
Tables supporting UZ Model grid development	*LB990501233129.001*
1-D hydrogeologic property set inversions and model calibration	*LB990501233129.002*
2-D fault hydrogeologic property calibration	*LB990501233129.003*
3-D UZ Model calibration	*LB990501233129.004*
3-D UZ Model calibration grid for non-water-perching mode	*LB990701233129.002*
Mesh file for generating 3-D UZ flow fields, CRWMS M&O 2000, U0000	*LB990701233129.001*

The primary data input for UZ Flow and Transport Model grids is the GFM for lithostratigraphic layering and major fault geometry at Yucca Mountain. GFM contains information about layer thickness and layer contact elevation, and defines fault orientation and displacement. Approximately 40 geologic units and 18 faults are incorporated into the 3-D UZ Flow and Transport Model grids. The ISM3.0 Model files are used to further define the units, especially the zeolitic zones of CHn. The repository layout data are used to locate areas for enhanced grid resolution.

CRWMS M&O (2000, U0000) also uses inputs of hydrologic unit definitions, fracture data for hydrologic units, and elevation data on the water table and perched water bodies. The hydrologic unit definitions are based on matrix properties (Flint 1998) discussed in Section 2.2.3. Fracture data, discussed in Section 2.2.4, are used to formulate the dual-permeability (dual-k) meshes. The vertical columns in the meshes are from the TCw bedrock to the water table. Water table and perched water elevation data for the lower UZ boundary are discussed in Section 2.2.10.

The final 3-D mesh files for UZ flow fields in Table 2-1 are developed with inputs from calibrated property sets, summarized in Section 2.2.11. The areal domain of the UZ models encompasses approximately 40 km^2 of the Yucca Mountain area. The areal grids are constructed with centers coinciding as close as practical with locations of surface-based boreholes, alcoves and niches, faults, ESF and ECRB drifts, and other domain nodes.

I.3 Infiltration/Climate Data

The USGS (2000, U0005) refines the climate estimates for the next 10,000 years. The climate AMR provides input to the USGS (2000, U0010), *Simulation of Net Infiltration for Modern and Potential Future Climates*. The major inputs and outputs are summarized in Table 2-2.

Table I-2. Infiltration/Climate Data for the UZ Model

Data Description	DTN or ACC
Daily precipitation input for 1980-1995 calibration (file MOD3-PPT.DAT)	GS950208312111.001 GS950208312111.002 GS960908312111.004 GS970108312111.001
Summary of the Day Data from the National Climatic Data Center (NCDC) for the Period Ending in 1995: for California, Nevada, Utah, Arizona, New Mexico, Colorado, and Wyoming.	MO9811NCDCSDDO.000
Streamflow records for 5 Yucca Mountain gauging stations (Upper Pagany Wash, Lower Pagany Wash, Wren Wash, Drill Hole Wash, Upper Split Wash).	NWIS Database ATS#YD-200000269
Parameters for SOLRAD subroutine for equations defined in Flint et al. (1996).	GS960908312211.003
Soil-depth-class map (Figure 13, Flint et al., 1996).	GS960908312211.003
Geospatial input parameters acquired from Flint et al. (1996) (elevation, slope, aspect, latitude, longitude, soil type, soil-depth class) (file 30MSITE.INP).	GS960908312211.003
100-year stochastic daily precipitation input (files 4JA.S01 and AREA12.S01).	GS960908312211.003
Calculated flux rates from neutron holes	GS960508312212.008
SO4 infiltration flux	GS910908315214.003 GS931008315214.032
Infiltration map - base case, lower bound, upper bound, CRWMS M&O 2000, U0010	GS000399991221.002

The climate USGS (2000, U0005) also used diatom and ostracode data from Owens Lake 1984-1992 cores, radiometric dating and $\delta^{18}O$ data from Devils Hole, and earth orbital parameter data for the last 10 million years and the next 100,000 years. The three climate states in VA are replaced by (1) the modern interglacial climate for about the next 400 to 600 years, (2) the monsoon climate for the duration of 900 to 1,400 years, and (3) the glacial-transition climate for the duration of 8,000 to 8,700 years. The modern climate uses data from site and regional meteorological stations. The monsoon climate uses data from Nogales, Arizona, and Hobbs, New Mexico, as upper-bound analogs and present-day site data as lower bound analog. The glacial transition climate uses data from Spokane, Rosalia, and St. John, all in Washington state, as upper-bound analogs and data from Beowawe, Nevada, and Delta, Utah, as lower-bound analogs.

The infiltration USGS (2000, U0010) also used elevation data, bedrock permeability and property data, geology maps, and soil properties as documented in the AMR. Simulation results and averaged values were presented for 123.7 km^2 area for the net infiltration model domain, for the 38.7 km^2 area of the UZ Flow and Transport Model domain, and for the 4.7 km^2 area of the 1999 design potential repository area. Over the potential repository area, the mean net infiltration is 4.7 mm/yr for the modern climate (with 0.4 mm/yr for the mean lower bound and 11.6 mm/yr for the mean upper bound), 12.5 mm/yr for the monsoon climate (with 4.7 mm/yr for the mean lower bound and 20.3 mm/yr for the mean upper bound), and 19.8 mm/yr for the glacial-transition climate (with 2.2 mm/yr for the mean lower bound and 37.3 mm/yr for the mean upper bound).

I.4 Matrix Properties

Matrix properties include permeability, porosity, residual saturation, and the van Genuchten α and m parameters used to describe water retention and relative permeability relationships (van Genuchten 1980, pp. 892–898). The input to the matrix properties for UZ Flow and Transport Model layers to the CRWMS M&O (2000, U0090), *Analysis of Hydrologic Property Data,* is based on the data transmittal listed in Table 2-3. The data of Busted Butte cores are used in CRWMS M&O (2000, U0060), *Radionuclide Transport Models under Ambient Conditions*.

Table I-3. Matrix Properties for the UZ Model

Data Description	DTN or ACC
Matrix hydrologic property data	GS960908312231.004
Matrix saturation, water potential and hydrologic property data	GS000399991221.004
Physical and hydraulic properties of core samples from Busted Butte	GS990308312242.007 GS990708312242.008

The sample collection and laboratory measurement methodologies are described by Flint (1998, pp. 11–19) and Rousseau et al. (1999, pp. 19–46). Core samples are grouped and analyzed according to the hydrogeologic units characterized by matrix properties (Flint 1998, pp. 19–46, CRWMS M&O 2000, U0000, Section 6.3, CRWMS M&O 2000, U0090, Section 6.2). Matrix permeability has been measured on 750 core samples from eight surface-based boreholes. Some samples with permeabilities too low to measure (nondetect results) were retested with a low-detection-limit permeameter. The nondetect results were included in defining the low-permeability units, especially the zeolitic zones of CHn. Matrix porosity values are based on 105ºC oven-dried measurements of 4,888 core samples, from 23 shallow boreholes and eight deep boreholes. The residual saturation is determined by relative humidity (RH) porosity and total porosity, with RH porosity determined in a 65ºC and 65% RH oven. The RH drying process is designed to remove water contributing flow, leaving only bound water and water in the smallest pores (Flint 1998, p. 17). The van Genuchten parameters are based on desaturation data from 75 samples. Desaturation data, with water potential and saturation measured several times while a core sample is drying, are used to calculate α and m by least-square fitting.

I.5 Fracture Properties, Air Permeabilities, and Liquid Release/Seepage Data

Fracture properties include fracture permeability, fracture porosity, van Genuchen fracture α and m parameters, fracture frequency, intensity, fracture interface area, and fracture aperture. Fracture properties are developed from analyzing fracture survey data and air-injection test data in CRWMS M&O (2000, U0090), *Analysis of Hydrologic Property Data*. The fracture permeability and van Genuchten parameters are updated in CRWMS M&O (2000, U0035), *Calibrated Properties Model,* after calibrations together with core saturation and *in situ* potential data, as summarized in Section 2.2.11. The fracture van Genuchten parameters and porosities are compared with ESF seepage test results for confirmation purposes. The seepage test results and other drift-scale hydrologic testing and air-permeability data are summarized in CRWMS M&O (2000, U0015), *In Situ Field Testing of Processes*. The seepage test results are used in CRWMS M&O (2000, U0080), *Seepage Calibration Model and Seepage Testing Data*. The major inputs and outputs from these AMRs related to fracture properties are tabulated in Table 2-4.

Table I-4. Fracture Geometry, Air Permeability, and Liquid Release/Seepage Data

Data Description	DTN or ACC
Fracture type (location, strike, dip, length):	
Sta. 0+60 to 4+00	GS971108314224.020
Sta. 4+00 to 8+00	GS971108314224.021
Sta. 8+00 to 10+00	GS971108314224.022
Sta. 10+00 to 18+00	GS971108314224.023
Sta. 18+00 to 26+00	GS971108314224.024
Sta. 26+00 to 30+00	GS971108314224.025
Sta. 30+00 to 35+00	GS960708314224.008
Sta. 35+00 to 40+00	GS960808314224.011
Sta. 40+00 to 45+00	GS960708314224.010
Sta. 45+00 to 50+00	GS971108314224.026
Sta. 50+00 to 55+00	GS960908314224.014
Sta. 55+00 to 60+00	GS971108314224.028
Sta. 60+00 to 65+00	GS970208314224.003
Sta. 65+00 to 70+00	GS970808314224.008
Sta. 70+00 to 75+00	GS970808314224.010
Sta. 75+00 to 78+77	GS970808314224.012
Sta. 4+00 to 28+00, Alcoves 3 and 4	GS960908314224.020
Alcove 5	GS960908314224.018
Alcove 6	GS970808314224.014
ECRB Cross Drift	GS990408314224.001
	GS990408314224.002
Fracture frequency:	
15 model units from 14 borehole locations	GS970408314222.003
NRG-7a	SNF29041993002.084
SD-12	TM000000SD12RS.012
Fracture type:	
Outcrop survey of Calico Hills formation	GS970308314222.001
Line surveys in the Bullfrog Member of the Crater Flat Tuff from Raven Canyon	GS930608312332.001
Line surveys in the Bullfrog Member of the Crater Flat Tuff from east side of Little Skull Mountain in Yucca Mountain Area	GS930608312332.002

Table I-4. Fracture Geometry, Air Permeability, and Liquid Release/Seepage Data (Continued)

Data Description	DTN or ACC
Air-injection test data:	
surface-based boreholes	GS960908312232.012
	GS960908312232.013
Alcoves 1, 2, 3 (upper TCw, Bow Ridge fault, upper PTn)	GS970183122410.001
Alcove 4 lower PTn fault-matrix interaction test bed	LB980901233124.009
Alcove 5 – single heater test area	LB960500834244.001
Alcove 5 – drift scale test area	LB970600123142.001
	LB980120123142.004
	LB980120123142.005
Alcove 6 fracture-matrix interaction test bed	LB980901233124.004
Niches 3566 and 3650, pre-excavation and post-excavation data	LB980001233124.002
Niches 3107 and 4788, pre-excavation and post-excavation data	LB980901233124.001
Niches, pre-excavation and post-excavation analyses	LB990601233124.001
Niche 4788, Alcoves 4 and 6, cross-hole analyses, and	LB990901233124.004
4 niches and 2 alcoves, statistical analyses	
Niche 3107 and Alcove 5, air-injection , tracer test and fracture porosity data	LB980912332245.002
Fracture properties for the UZ Model grids and uncalibrated fracture and matrix properties for the UZ model layers, CRWMS M&O 2000, U0090	*LB99050501233129.001*
Seepage and liquid release data:	
Niches 3566 and 3650, pre-excavation liquid-release data, and	LB980001233124.003
Niche 3566, post-excavation seepage data	
Niches 3566, 3650, 3107 and 4788, pre-excavation liquid-release data and analyses, and	LB980901233124.003
Niche 3566, post-excavation seepage analyses	
Niche 3107, post-excavation seepage test data	LB990601233124.002
Seepage Calibration model, software routines and files, CRWMS M&O 2000, U0080	*LB990831012027.001*

Table I-4. Fracture Geometry, Air Permeability, and Liquid Release/Seepage Data (Continued)

Data Description	DTN or ACC
Infiltration and seepage data, Alcove 1 upper TCw El Nino test	GS000399991221.003
Water intake rate and wetting front detection data	
Alcove 4 lower PTn fault-matrix interaction test bed	LB990901233124.005
Alcove 6 fracture-matrix interaction test bed	LB990901233124.002

The precalibrated fracture permeabilities are based on air permeabilities from air-injection tests in vertical boreholes and ESF alcoves. For TCw, fracture permeabilities were based on tests in four vertical boreholes (NRG-7/7A, NRG-6, SD-12, and UZ-16) and Alcoves 1, 2, and 3. For PTn, permeability data are from one borehole (NRG-7/7A) and Alcove 3. For TSw, the permeability data are from the four boreholes and the tests at the Single Heater Test and the Drift Scale Test areas in Alcove 5. For CHn, permeability data are from a single sampled interval in borehole UZ-16. No air-injection data are available for the Prow Pass, Bullfrog, and Tram units. For model layers where no data are available, analogs to other units are used. The fracture properties in faults are based on air-injection tests in Alcove 2 for the Bow Ridge fault and in Alcove 6 for the Ghost Dance fault. The fracture permeabilities are used as prior information for the calibrated properties model CRWMS M&O (2000, U0035).

The test-interval lengths between packers were approximately 4 m for vertical boreholes, 1 to 3 m for Alcoves 1, 2, and 3, and 5 to 12 m in the Alcove 5 SHT and DST areas. Extensive air-permeability data on the scale of 0.3 m were measured in the niches (CRWMS M&O 2000, U0015). For Tptpmn, the niche data sets have approximately one order of magnitude lower mean values and two orders of magnitude higher range than the vertical borehole values. In this comparison, only the pre-excavation permeability values from the niche sites are used. The post-excavation data are used in the seepage calibration model CRWMS M&O (2000, U0080).

The detailed line survey (DLS) data along ESF, together with air-permeability data, are the primary data sets used to derive other fracture properties. Borehole fracture data were used only when no data or incomplete data were available from the ESF DLS. Fracture spacing and frequency are calculated from averaging the DLS. The fracture intensity is calculated by dividing the trace length of the fracture by the area surveyed. Fracture interface area is calculated by dividing the fracture area by the volume of the interval surveyed. Fracture apertures are calculated by the cubic law relationship. The van Genuchten fracture m parameter is determined by fitting an analytical solution resulting from the aperture size distribution to the fracture saturation-capillary pressure curve. The fracture alpha parameter (α_f) is related to the aperture by the Young-LaPlace equation. For Tptpmn, the average of log(α_f) value is -3.17 from the fracture network estimation, compared to the value of -3.16 from averaging over seepage tests in five niche borehole intervals.

Fracture porosities are derived from a combination of field gas-tracer-test data and estimates from the geometry of fracture network. The porosities from gas-tracer tests range from 0.6% to

2%. The porosities from drift seepage tests have the average value of 1.3% from three water-content values determined from seepage front arrival times. The value of 1% is used as an order-of-magnitude estimate for Tptpmn (model layer tsw34). For model layers without field test data, fracture porosities are estimated from aperture and frequency of the fracture network, and relative values are scaled to the tsw34 value.

I.6 Pneumatic Data

The CRWMS M&O (2000, U0035), *Calibrated Properties Model*, uses the borehole pneumatic data in the inversions to calibrate the tuff model-layer and fault properties. The CRWMS M&O (2000, U0015), *In Situ Testing of Processes*, compiled the moisture monitoring data collected along the drifts and in alcoves for the evaluation of moisture removal induced by ventilation operations. Both data sets are summarized in Table 2-5.

Table I-5. Pneumatic Data for the UZ Model

Data Description	DTN or ACC
In situ data in surfaced-based boreholes:	
NRG-6 and NRG-7a, pneumatic pressure and temperature	GS950208312232.003 GS951108312232.008 GS960308312232.001 GS960808312232.004
NRG#5, pneumatic pressure	GS960208312261.001
SD-7, pneumatic pressure	GS960908312261.004
UZ-7a, NRG-6, NRG-7a, and SD-12, pneumatic pressure and temperature	GS960308312232.001
UZ#4, UZ#5, UZ-7a, NRG-6, NRG-7a, and SD-12, pneumatic pressure, temperature, and water potential	GS970108312232.002
UZ#4, UZ#5, UZ-7a, NRG-7a, and SD-12, pneumatic pressure, temperature, and water potential:	
1/1/97 - 6/30/97	GS970808312232.005, MOL.19980226.0042-0045
7/1/97 - 9/30/97	GS971108312232.007, MOL.19980226.0607-0614
10/1/97 - 3/31/98	GS980408312232.001, MOL. 19980706.0269

Table I-5. Pneumatic Data for the UZ Model (Continued)

Data Description	DTN or ACC
Moisture monitoring data in underground drifts:	
21+00/LB20, 28+30/LB50, 35+00/LB40	LB960800831224.001
21+00/LB20, 28+30/LB50, 35+00/LB40, 42+50/LB60, 47+00/LB70, 51+73/LB80, 57+50/LB90, 64+59, 67+00, 73+50 10/1/96 – 1/31/97	LB970300831224.001
Before and After the Completion of the ESF	LB970801233124.001
	LB970901233124.002
7+20/GS#3, 10+93/GS#4, 28+93, 51+64, 67+20, 10/1/96 – 1/31/97	GS970208312242.001
2/1/97 – 7/3197	GS970708312242.002
8/1/97 – 7/31/98	GS980908312242.024
ECRB Cross Drift 0+25, 2+37, 2+88, 3+38, 10+03, 21+07, 24+75, 4/8/98 – 7/31/98	GS980908312242.035
ECRB Cross Drift 14+35, 21+40, 25+55	LB990901233124.006

Pneumatic pressure data measured *in situ* in five boreholes (NRG#5, NRG-6, NRG-7a, SD-7, and SD-12) are used in the 1-D inversion. These boreholes do not intersect known large faults, and thus the pneumatic pressure data are representative of the formation rock of Yucca Mountain. Pneumatic pressure data measured in borehole UZ-7a are used in the 2-D inversion for fault properties. This borehole intersects the Ghost Dance fault, and thus the pneumatic pressure data are representative of the faulted rock of Yucca Mountain.

Thirty days of data from each borehole are used for either the simultaneous inversion of five borehole columns or for the 2-D inversion for fault properties. The data are selected from the time period prior to detection of any influence associated with construction of the ESF. Most of the attenuation and lag of barometric signal occurs within the PTn and not in the fractured TCw or TSw. The data from all PTn instrument stations or ports, along with data from one TCw port (nearest to the bottom) and two TSw ports (uppermost and lowest), are used in the inversions. PTn contains multiple layers and has heterogeneous permeability distributions calibrated by pneumatic inversion.

With the penetration of the ESF drifts underground, atmospheric conditions were introduced into deep tuff units along the drifts. The barometric signals in the TSw ports became less attenuated as the ESF passed by the boreholes. In addition to barometric pressure, relative humidity, temperature, and/or air velocities are monitored along the drifts and in the alcoves, as summarized in Table 2-5. The moisture conditions in the drifts are sensitive to the ventilation operations. Ventilation can remove the moisture, dry up the rock, and suppress the seepage. The perturbation to the ambient UZ conditions by the ESF drifts is *de facto* a mountain scale test at Yucca Mountain. UZ model calibration for the ambient conditions does not use the post-penetration data. Detected changes in pneumatic and moisture conditions can be used to validate the models, assess the impacts of drift construction and operation, and provide inputs to repository design.

I.7 Saturation Data

The CRWMS M&O (2000, U0035), *Calibrated Properties Model*, uses the core saturation data summarized in Table 2-6 in the inversions to calibrate the tuff model-layer and fault properties. The CRWMS M&O (2000, U0015), In Situ *Testing of Processes*, compiled the saturation data collected in alcoves and niches. The saturation data sets are summarized in Table I-6.

Table I-6. Saturation Data for the UZ Model

Data Description	DTN or ACC
Saturation data from surface-based borehole cores:	
UZ-7a, UZ-14, UZ#16, SD-7, SD-9, and SD-12	GS000399991221.004
SD-6	GS980808312242.014
WT-24	GS980708312242.010
Saturation data from underground borehole cores	
Alcove 3, 1 borehole	GS980908312242.033
Alcove 4, 2 boreholes	GS980908312242.032
North Ramp, 7+27 – 10+70	GS980308312242.005
South Ramp, 59+65 – 76+33	GS980308312242.003
3 boreholes in Alcove 6,	GS980908312242.029
1 borehole in Alcove 7	GS980908312242.028
Niche 3566, 3 main boreholes, 6 lateral boreholes	GS980908312242.018 GS980908312242.020
Niche 3650, 7 main boreholes	
ECRB Cross Drift Starter tunnel, 1 slant borehole below the invert	GS980908312242.030
Time domain reflectometry measurements:	
South Ramp, 8/1/97 - 1/4/98	GS980308312242.001
Crossover point, ESF Main Drift 30+62 below the ECRB Cross Drift, 6/19/98 - 7/16/98	LB980901233124.014

Saturation data measured on core from seven deep boreholes (SD-6, SD-7, SD-9, SD-12, UZ-14, UZ#16, and WT-24) are used for the 1-D inversions. Saturation data measured on core from borehole UZ-7a are used for the 2-D inversions.

Some of the cores from shallow boreholes in alcoves and niches are affected by the drying process, which can decrease the saturation several meters into the rock from the drift walls. The dry samples are not used in UZ model calibrations. The time-domain reflectometry (TDR) sensors are widely used in soil studies and are applied in the ESF boreholes or walls for detection of saturation changes and wetting front arrivals. Not included in Table 2-6 are neutron-hole surveys in the ESF, which were widely used in the infiltration study.

I.8 Water Potential Data

The CRWMS M&O (2000, U0035), *Calibrated Properties Model*, uses the borehole water potential data in the inversions to calibrate the tuff model-layer and fault properties. The CRWMS M&O (2000, U0015), In Situ *Testing of Processes*, compiled the water-potential data in the ESF to evaluate the extent of the drying into the rock and *in situ* profiles along the drifts. The water-potential data sets are summarized in Table 2-7.

Table I-7. Water-Potential Data

Data Description	DTN or ACC
In situ water-potential data with psychrometer in surface-based boreholes	
UZ#4, NRG-6, NRG-7a, SD-12, and UZ-7a	GS950208312232.003 GS951108312232.008 GS960308312232.001 GS960808312232.004 GS970108312232.002 GS970808312232.005 GS971108312232.007 GS980408312232.001
Psychrometer data in underground drifts	
Niche 3566, 3 main boreholes, 5 lateral boreholes, 5/9/97–10/21/97	LB980001233124.001
Niche 3650, 6 main boreholes, 7/1/97–7/28/97	
Niche 3107, 3 main boreholes, 12/22/97–1/8/98	
Cross over point, ESF Main Drift 30+62 below the ECRB Cross Drift, 6/19/98–7/16/98	LB980901233124.014
ECRB Cross Drift Starter tunnel, 1 slant borehole below the invert	LB980901233124.014
Heat dissipation probe (HDP) data in underground drifts:	
Niche 3566, 21 HDP, 11/4/97–7/31/98	GS980908312242.022
Alcove 7, 12/9/97–1/31/98	GS980308312242.007
South Ramp, 8/1/97–1/4/98	GS980308312242.002
ECRB Cross Drift 0+50–7+75, 6 HDP, 4/23/98–7/31/98	GS980908312242.036
ECRB Cross Drift	GS000399991221.001
Filter paper data on cores in underground drifts:	
Alcove 3, 1 core hole	GS980908312242.033
Alcove 4, 2 core holes	GS980908312242.032
North Ramp, 18 boreholes, Alcove 4, 3 boreholes, and South Ramp, 46 boreholes, HQ, 2-m length	GS980308312242.004

Five surfaced-based boreholes have enabled continuous measurements of *in situ* water potential with psychrometer since 1997 (see also Table 2-5 on pneumatic pressure data). Data measured in four boreholes (UZ#4, NRG-6, NRG-7a, and SD-12) are used in the 1-D inversions for rock formation outside the fault zones. Data from UZ-7a intercepting the Ghost Dance fault are used in the 2-D inversions. The inversions use the *in situ* water-potential data summarized in the first entry of Table 2-7 and the core saturation data of Table 2-6.

Water-potential data measured in the ESF short boreholes and on cores generally have values substantially different from *in situ* values because of drying by drift ventilation or drying during drilling and/or handling. Drift-ventilation effects are minimized by bulkhead sealing in niches, Alcove 7, and in the second half of the ECRB Cross Drift. Preliminary data indicate that the water-potential values in the lower tuff units are in the range of -1 bar, substantially higher than values measured in the ESF Main Drift and/or sealed intervals in surface-based boreholes.

I.9 Geochemical Data

The CRWMS M&O (2000, U0085), *Analysis of Geochemical Data for the Unsaturated Zone*, and CRWMS M&O (2000, U0100), *Unsaturated Zone and Saturated Zone Transport Properties*, analyze and evaluate the UZ sorption and diffusion parameters for the UZ transport processes.

Table I-8. Geochemical Data for the UZ Model

Data Description	DTN or ACC
Mineralogic data:	
Model input and output files for mineralogic Model “MM3.0” Version 3.0.	LA9908JC831321.001
Mineralogic characterization of the ESF SHT Block	LASL831151AQ98.001
Chloride, chlorine-36, bromide, sulfate data:	
Deep boreholes, halide and ^{36}Cl analyses	
NRG-4, NRG-6, and NRG-7/7A	LAJF831222AQ96.005
UZ#16	LAJF831222AQ96.014
UZ-14	LAJF831222AQ96.015
SD-12	LAJF831222AQ97.007
ESF, Cl, ^{36}Cl, Br, S	LA9909JF831222.010 LA9909JF831222.005 LAJF831222AQ98.004
ESF, CWAT#1, #2, and #3, Cl, Br, S	LAJF831222AQ98.007
Niches 3566 and 3650, Cl, Br, S	LA9909JF831222.012
Tritium data:	
SD-7, SD-9, UZ-14, NRG-7a	GS951208312272.002
Alcoves 2 and 3	GS961108312261.006
Alcove 5 SHT	GS970608312272.005
UZ-14, C#2, C#3, WT##, WT#17, WT-24, 10/06/97 – 07/01/98	GS991108312272.004

Table I-8. Geochemical Data for the UZ Model (Continued)

Data Description	DTN or ACC
DST water and gas chemistry data:	
CO_2 gas analyses	LB991215123142.001
DST, 4th, 5th, and 6th Qtr. CO_2 data	LB990630123142.003
UZ diffusion and dispersivity coefficients:	MO9807SPAAREST.000 MO9810SPA00026.000 MO9807SPATBDOC.000
UZ retardation data:	
Np sorption column measurements	LA000000000034.002
Radionuclide elution data through crushed tuff columns and through fractured tuff columns	LAIT831341AQ95.001 LAIT831341AQ97.001
Radionuclide retardation measurements of Ba, CE, Se, Sr, U, Pu, and. Np	LAIT831341AQ96.001
Kd for zeolitic rocks in UZ transport model	LABR831371DN98.002
Busted Butte UZ transport test data:	
Tracer Breakthrough Concentrations	LA9909WS831372.001 LA9909WS831372.002
Radionuclide sorption coefficients of Np, Pu, U, Se	LA9909WS831372.003
Ground penetrating radar	LB990423123112.001 LB990423123112.002 LB000123123112.001
ESF tracer field test data:	
Alcove 6 fracture-matrix interaction test bed	LB990901233124.001
Niche 3650 drift seepage test	LB990601233124.003
Surface water data:	
Southern Nevada, 8/83 – 8/86, isotope content and temperature of precipitation	GS920908315214.032
Fortymile Wash, 1993 water year, water quality data	GS940308312133.002
Fortymile Wash, 1995 water year , water quality data	GS960308312133.001

Table I-8. Geochemical Data for the UZ Model (Continued)

Data Description	DTN or ACC
Pore water data:	
Triaxial-Compression Extraction	GS90090123344G.001
NRG-6, NRG7/7a, UZ-14 and UZ-N55, and UZ#16, chemical data from cores	GS950608312272.001
UZ-1, UZ-14, UZ#16, NRG-6, NRG-7a, SD-7, SD-9, Alcove 3 RBT#1, RBT#4, ESF rubble, 94-96	GS961108312271.002
10/1/96 – 1/31/97	GS970208312271.002
NRG-7a, SD-7, SD-9, SD-12, UZ-14, 2/1/97 – 8/31/97	GS970908312271.003
UZ-7a, WT-24, SD-6, SD-7, SD-12, 97 – 98	GS980108312272.004
UZ-14 and UZ-16	GS990208312271.001
Uranium isotopic data:	
SW Nevada–SE California, U isotopic analyses	GS930108315213.004
U and Th analyzed 1/94 – 9/96	GS960908315215.013
Alcove 5, 4/97 – 5/97	GS970508312271.001
12/96 – 12/97	GS980108312322.003
5/89 – 8/97	GS980208312322.006
1/15/98 – 8/15/98	GS980908312322.009
Strontium isotope data:	
4/8/88 – 5/2/89	GS920208315215.012
5/3/89 – 5/9/91	GS910508315215.005
5/10/91 – 2/28/92	GS920208315215.008
11/19/92 – 12/3/93	GS931008315215.029
12/6/93 – 8/17/94	GS941108315215.010
9/7/94 – 5/4/95	GS950608315215.002
5/11/95 – 8/5/86	GS960908315215.012
SD-7 and ESF calcite	GS970908315215.011
WT-24 and J-13	GS981008315222.004
SD-9 and Sd-12	GS990308315215.004
SD-9 and SD-12, X-ray fluorescence elemental compositions	GS990308315215.003
UZ-1 carbon and oxygen data:	
UZ-1, ^{14}C	GS911208312271.009 GS930108312271.010 GS930408312271.020 GS940408312271.005 GS940408312271.008
UZ-1, $^{13}C/^{12}C$	GS911208312271.010 GS930108312271.009 GS930408312271.019
UZ-1, $^{13}C/^{12}C$ and $^{18}O/^{16}O$	GS940408312271.004

Geochemical data are used in the ambient geochemical model for CRWMS M&O (2000, U0050), *UZ Flow Models and Submodels*. Pore-water samples are mainly collected from eight boreholes (NRG-6, NRG-7A, SD-7, SD-9, SD-12, UZ#4, UZ-14, and UZ#16). Chloride concentrations are used in water-infiltration calibration to match the chloride distributions along the ESF and the ECRB Cross Drift. Hydro-geochemical simulations are carried out for the NRS-7A column and for the WT-24 column, with the calcite data available in the second borehole.

The transport properties are used in the CRWMS M&O (2000, U0060), *Unsaturated Zone Radionuclide Transport Model.* The K_d values for radionuclides ^{99}Tc, ^{237}Np, ^{239}U, and its daughter products (including the ^{235}U with modest absorption and long half-life) are among the important parameters used for the transport calculations. Colloidal transport is sensitive to filtration mechanisms, which are evaluated in the CRWMS M&O (2000, U0070), *Unsaturated Zone Colloid Transport Model.*

I.10 Temperature Data

The CRWMS M&O (2000, U0050), *UZ Flow Models and Submodels*, uses temperature profiles for calibration.

Table I-9. Temperature Data for the UZ Model

Data Description	DTN or ACC
In situ temperature data in surface-based boreholes NRG-6, NRG-7a, UZ#4, SD-12, and UZ-7a	GS950208312232.003 GS951108312232.008 GS960308312232.001 GS960808312232.004 GS970108312232.002 GS970808312232.005 GS971108312232.007 GS980408312232.001
Thermal conductivity, grain specific heat	SNT05071897001.012
Heat load data and repository footprint	SN9907T0872799.001
Hydrologic and thermal properties of drift design elements	SN9908T0872799.004
Effective thermal conductivity	SN9907T0872799.002

The recent data from six boreholes (NRG-6, NRG-7A, SD-12, UZ#4, UZ#5, UZ-7) are used for the calibration. The temperature profile data set (Sass et al. 1988) is one of the first sets of data used to indicate that the percolation flux is higher than the low value in the sub-mm/yr range. With low percolation flux, the convective contribution to heat transfer is suppressed. The deviation from conduction-only profiles is used to determine percolation flux.

I.11 Perched Water Data

The CRWMS M&O (2000, U0050), *UZ Flow Models and Submodels*, uses perched water data for calibration.

Table I-10. Perched Water Data for the UZ Model

Data Description	DTN or ACC
Water Table Elevations	MO9609RIB00038.000
Perched Water Elevations	
UZ-14	GS960308312312.005
WT-24	GS98058312313.001
G-2	GS970208312312.003
G-2	GS981008312313.003
SD-9 and NRG-7a	MOL.19980220.0164
SD-7	MOL.19971218.0442

The perched water elevations are used together with matrix liquid saturations and water potentials for the calibration. Perched water may occur where percolation flux exceeds the capacity of the tuff units to transmit vertical flux in the UZ. A permeability-barrier model and an unfractured zeolite model are used to determine the calibrated parameters for the perched water zones.

I.12 Calibrated Property Sets

The CRWMS M&O (2000, U0035), *Calibrated Properties Model*, uses the saturation-potential inversion described in Section 2.3.7 and the pneumatic inversion in Section 2.3.5 to generate the calibrated properties sets summarized in Table 2-11. The calibrated property sets are used as inputs to the AMRs on UZ Flow and Transport Field.

Table I-11. Property Sets for the UZ Model

Data Description	DTN or ACC
Flow fields and calibrated hydrologic property set	LB971212001254.006
Top and bottom boundary temperatures, pressure, and boundary elevations	LB990701233129.002
Calibrated 1-D parameter set for the UZ Flow and Transport Model, FY99	
for basecase infiltration	*LB997141233129.001*
for upper-bound infiltration	*LB997141233129.002*
for lower-bound infiltration	*LB997141233129.003*
Drift scale calibrated 1-D property set, FY99	
for basecase infiltration	*LB990861233129.001*
for upper-bound infiltration	*LB990861233129.002*
for lower-bound infiltration	*LB990861233129.003*

Table I-11. Property Sets for the UZ Model (Continued)

Data Description	DTN or ACC
Calibration for CRWMS M&O 2000, U0035 Calibrated Properties Model	
for 1-D, mountain-scale calibration	*LB991091233129.001*
for 1-D, draft-scale calibration	*LB991091233129.002*
for 2-D, fault calibration	*LB991091233129.003*
for 1-D, calibrated fault properties for the UZ Flow and Transport Model	*LB991091233129.001*

Calibration of the UZ Flow and Transport Model is carried out in a series of steps. For the 1-D, mountain-scale calibration of formation rock (nonfault) parameters and the 2-D fault calibration, first, saturation and potential data are inverted, with permeabilities fixed. Second, the pneumatic data are inverted to calibrate the permeabilities. Third, the calibrated parameters are checked against the saturation and potential data and calibrated if necessary. And fourth, a “final” check against the pneumatic data is performed. The iteration can in principle be carried out with repeated cycles. As a result of the pneumatic inversion, site-scale fracture permeabilities in most of the TSw model layers are increased by almost two orders of magnitude compared to the prior information determined from air-injection tests. The air-injection tests use packed intervals with length a few meters or less, which is closer to the range of drift scale than site scale. In drift-scale calibration, the pneumatic pressure data are excluded. The drift-scale calibrated permeabilities are closer to drift-scale measured values.

The calibrated property sets are used as the starting point in other calibration models for different processes in different scales. The CRWMS M&O (2000, U0050), *UZ Flow Models and Submodels*, uses additional chloride, calcite, temperature and perched water data to formulate the UZ 3-D flow fields. The CRWMS M&O (2000, U0080), *Seepage Calibration Model and Seepage Testing Data*, uses UZ site-scale flow field as boundary conditions for additional drift scale calibration against niche seepage data. The CRWMS M&O (2000, U0110/N0120), *DST Thermo-Hydro-Chemical Model*, uses the calibrated property set and calibrated against DST THC test results. The CRWMS M&O (2000, U0060), *Unsaturated Zone Radionuclide Transport Model*, uses additional transport properties to evaluate radionuclide and colloid transport.

ATTACHMENT II – List of DTNs for Figures and Tables

The Q-status of the data listed in Tables II-1 and II-2 is provided in the DIRS database.

Table II-1. DTNs for Figures

Figure Number	Data Tracking Number (DTN)
1.1-1.	N/A
1.1-2.	N/A
2.1-1.	N/A
2.1-2.	N/A
2.1-3.	N/A
2.1-4.	N/A
2.2-1.	LB980930123112.001
2.2-2.	(a) N/A (b) GS000399991221.002
2.2-3.	N/A
2.2-4.	N/A
2.2-5.	N/A
2.2-6.	LB990901233124.002
2.2-7.	(a) N/A (b) N/A (c) N/A (d) LB990901233124.005
2.2-8.	(a) N/A (b) N/A (c) LB991131233129.002 GS000399991221.003
2.2-9.	N/A
2.2-10.	N/A
2.2-11.	N/A
2.2-12.	N/A
2.2-13.	N/A
2.2-14.	N/A
2.4-1.	N/A
2.4-2.	N/A
2.4-3.	N/A
2.4-4.	N/A
3.2-1.	MO9901MWDGFM31.000
3.2-2.	N/A
3.2-3.	MO9901MWDGFM31.000
3.2-4.	N/A
3.2-5.	N/A
3.2-6.	MO9901MWDGFM31.000
3.2-7.	MO9910MWDISMMM.003
3.3-1.	N/A
3.3-2.	N/A
3.3-3.	N/A
3.3-4.	N/A
3.3-5.	N/A
3.3-6.	N/A
3.3-7.	N/A
3.3-8.	N/A
3.4-1.	N/A
3.4-2.	N/A

Table II-1. DTNs for Figures (Continued)

3.4-3.	(a) MO9901MWDISMMM.000 (b) MO9910MWDISMMM.003
3.4-4.	(a) MO9901MWDISMRP.000 (b) MO9910MWDISMRP.002
3.4-5.	LB990051233129.001
3.4-6.	(a) N/A (b) LB990501233129.004 (c) LB990701233129.001
3.4-7	(a) MO9901MWDGFM31.000 (b) LB990701233129.001
3.4-8	(a) MO9901MWDGFM31.000 (b) LB990701233129.001
3.4-9	(a) MO9901MWDGFM31.000 (b) LB990501233129.004
3.5-1.	N/A
3.5-2.	GS000399991221.002
3.5-3.	N/A
3.5-4.	GS000399991221.002
3.5-5.	GS000399991221.002
3.5-6.	CRWMS M&O 2000 (U0095)
3.6-1.	N/A
3.6-2.	N/A
3.6-3.	N/A
3.6-4	LB991091233129.001
3.6-5	LB991091233129.003
3.6-6.	LB997141233129.001
3.6-7.	LB997141233129.001
3.6-8.	GS960308312232.001 GS980908312242.036 LB990801233129.003 LB991121233129.007
3.6-9.	N/A
3.7-1.	N/A
3.7-2.	N/A
3.7-3.	N/A
3.7-4.	(a) LB990801233129.003 (b) LB990801233129.015 (c) LB990801233129.009
3.7-5.	N/A
3.7-6.	N/A
3.7-7.	LB990801233129.003
3.7-8.	(a) LB990801233129.003 (b) LB990801233129.003
3.7-9.	LB990801233129.025
3.7-10.	(a) LB990801233129.003 (b) LB990801233129.003 (c) LB990801233129.004
3.7-11.	(a) LB990801233129.003 (b) LB990801233129.015 (c) LB990801233129.009
3.7-12.	(a) LB990801233129.003 (b) LB990801233129.015 (c) LB990801233129.009
3.7-13.	(a) LB990801233129.003 (b) LB990801233129.003

Table II-1. DTNs for Figures (Continued)

3.7-14	LB990801233129.003 LB990801233129.009 LB990801233129.015 GS000399991221.004
3.7-15	LB991121233129.007 GS960308312232.001
3.7-16.	SN9912T0581699.003 SN0001T0581699.004
3.7-17.	SN9912T0581699.003
3.7-18.	SN9912T0581699.003 SN0001T0581699.004
3.8-1.	N/A
3.8-2.	N/A
3.8-3	GS000399991221.002 LB990801233129.003
3.8-4.	LB991131233129.003
3.8-5	LB991131233129.003
3.8-6.	LB991131233129.001
3.8-7.	LB991131233129.003
3.8-8	N/A
3.9-1.	N/A
3.9-2.	N/A
3.9-3.	N/A
3.9-4.	N/A
3.9-5.	N/A
3.9-6.	LB980001233124.003 LB990831012027.001
3.9-7.	N/A
3.9-8.	N/A
3.9-9.	N/A
3.9-10.	SN9912T0511599.002
3.9-11.	SN9912T0511599.002
3.9-12.	N/A
3.10-1.	N/A
3.10-2.	N/A
3.10-3.	N/A
3.10-4	LB991200DSTTHC.002
3.10-5	LB991200DSTTHC.002
3.10-6.	LB991200DSTTHC.002
3.10-7.	LB991200DSTTHC.002
3.10-8.	LB991200DSTTHC.002
3.10-9.	LB991200DSTTHC.002
3.10-10.	LB991200DSTTHC.002
3.10-11.	LB991200DSTTHC.002
3.10-12.	LB991200DSTTHC.002
3.10-13.	N/A
3.11-1.	N/A
3.11-2.	N/A
3.11-3.	N/A
3.11-4.	LB991220140160.012
3.11-5.	LB991220140160.012
3.11-6.	LB991220140160.012
3.11-7.	LB991220140160.017
3.11-8.	LB9908T1233129.001
3.11-9.	LB9908T1233129.001

Table II-1. DTNs for Figures (Continued)

3.11-10.	LB991220140160.012 LB991220140160.017
3.11-11.	N/A
3.11-12.	SN9908T0581699.001 LB990901233129.001
3.11-13.	SN9908T0581699.001 LB990901233129.001
3.11-14.	SN9908T0581699.001 LB990901233129.001
3.11-15.	SN9908T0581699.001 LB990901233129.001
3.11-16.	N/A
3.12-1.	N/A
3.12-2.	N/A
3.12-3.	N/A
3.12-4.	LB991201233129.001
3.12-5.	LB991201233129.001
3.12-6.	LB991201233129.001
3.12-7.	LB991201233129.001
3.12-8.	LB991201233129.001
3.12-9.	LB991201233129.001
3.12-10.	LB991201233129.001
3.12-11.	LB991201233129.001
3.12-12.	LB991201233129.001
3.12-13.	LB991201233129.001
3.12-14.	LB991201233129.001
3.12-15.	N/A
5.1-1.	N/A
5.1-2.	N/A
5.1-3.	N/A
5.1-4.	N/A
5.1-5.	N/A

Table II-2. DTNs for Tables

Table	Data Tracking Number (DTN)
1-1.	N/A
1-2.	N/A
1.2-1	N/A
1.2-2.	N/A
1.2-3.	N/A
1.3-1.	N/A
2.3-1.	N/A
2.5-1.	N/A
3.2-1.	N/A
3.2-2.	N/A
3.4-1.	N/A
3.5-1.	N/A
3.5-2.	GS000399991221.002
3.5-3.	GS000399991221.002
3.5-4.	GS000399991221.002
3.7-1.	GS000399991221.002
3.7-2.	LB990801233129.003 LB990801233129.009 LB990801233129.015
3.7-3.	LB990801233129.003 LB990801233129.009 LB990801233129.015
3.7-4.	LB990801233129.003 LB990801233129.009 LB990801233129.015
3.7-5.	LB990801233129.001 LB990801233129.003 LB990801233129.005 LB990801233129.007 LB990801233129.009 LB990801233129.011 LB990801233129.013 LB990801233129.015 LB990801233129.017
3.8-1.	LB991131233129.001
3.9-1.	LB991101233129.001
3.9-2.	SN9912T0511599.002
3.10-1.	LB991200DSTTHC.001
3.10-2.	N/A
3.10-3.	N/A
3.11-1.	CRWMS M&O 2000 (U0100)
3.11-2.	CRWMS M&O 2000 (U0100)
3.11-3.	LB991220140160.012
3.11-4.	LA9909WS831372.003
3.12-1.	N/A
3.13-1.	N/A
4.2-1.	N/A
4.3-1.	N/A
5.2-1.	N/A

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DTN: GS000399991221.002. Rainfall/Runoff/Runon 1999 Simulations. Submittal date: 03/10/2000.

DTN: GS000399991221.003. Preliminary Alcove 1 Infiltration Experiment Data. Submittal date: 03/10/2000.

DTN: GS000399991221.004. Preliminary Developed Matrix Properties. Submittal date: 03/10/2000.

DTN: GS960308312232.001. Deep Unsaturated Zone Surface-Based Borehole Instrumentation Program Data from Boreholes USW NRG-7A, USW NRG-6, UE-25 UZ#4, UE-25 UZ#5, USW UZ-7A, and USW SD-12 for the Time Period 10/01/95 through 3/31/96. Submittal date: 04/04/1996.

DTN: GS980908312242.036. Water Potentials Measured With Heat Dissipation Probes in ECRB Holes from 4/23/98 to 7/31/98. Submittal date: 09/22/1998.

DTN: LA9909WS831372.003. Sorption of Np, Pu, and Am on Rock Samples from Busted Butte, NV. Submittal date: 09/30/99.

DTN: LB980001233124.003. Liquid Release Tests Performed to Determine if a Capillary Barrier Exists in Niches 3566 and 3650. Submittal date: 04/23/1998.

DTN: LB980930123112.001. Surface to ESF Seismic Tomography. Submittal date: 09/30/1998.

DTN: LB990051233129.001. Extent of Vitric Region Used to Assign Material Properties in FY 9 UZ Model Layers; Figure 5 From AMR U0000, “Development of Numerical Grids for UZ Flow and Transport Modeling.” Submittal date: 09/24/99.

DTN: LB990501233129.004. 3-D UZ Model Calibration Grids for AMR U0000. “Development of Numerical Grids of UZ Flow and Transport Modeling.” Submittal date: 09/24/1999.

DTN: LB990701233129.001. 3-D UZ Model Grids for Calculation of Flow Fields for PA for AMR U0000, “Development of Numerical Grids for UZ Flow and Transport Modeling.” Submittal date: 09/24/1999.

DTN: LB990801233129.001. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." (Flow Field #1). Submittal date: 11/29/1999.

DTN: LB990801233129.003. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." (Flow Field #3). Submittal date: 11/29/1999.

DTN: LB990801233129.004. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." (Flow Field #4). Submittal date: 11/29/99.

DTN: LB990801233129.005. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." (Flow Field #5). Submittal date: 11/29/1999.

DTN: LB990801233129.007. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." (Flow Field #7). Submittal date: 11/29/1999.

DTN: LB990801233129.009. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." (Flow Field #9). Submittal date: 11/29/1999.

DTN: LB990801233129.011. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." (Flow Field #11). Submittal date: 11/29/1999.

DTN: LB990801233129.013. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." (Flow Field #13). Submittal date: 11/29/1999.

DTN: LB990801233129.015. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." (Flow Field #15). Submittal date: 11/29/1999.

DTN: LB990801233129.017. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." (Flow Field #17). Submittal date: 11/29/1999.

DTN: LB990801233129.025. TSPA Grid Flow Simulations for AMR U0050, "UZ Flow Models and Submodels." Flow Field #25: Present Day Mean Infiltration for Flow-Through Perched-Water Conceptual Model. Submittal date: 3/11/00.

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DTN: LB9908T1233129.001. Transport simulations for the low, mean, and upper infiltration scenarios of the present-day, monsoon, and glacial transition climates. Submittal date: 3/11/00.

DTN: LB990901233124.002. Alcove 6 Flow Data for AMR U0015, "In Situ Filed Testing of Processes." Submittal date: 11/01/99.

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DTN: LB991091233129.003. Two-Dimensional Fault Calibration for AMR U0035, “Calibrated Properties Model.” Submittal date: 10/22/99.

DTN: LB991101233129.001. Model Input/Output Files Supporting Seepage Model for PA in AMR U0075, “Seepage Model for PA Including Drift Collapse.” Submittal date: 11/30/99.

DTN: LB991121233129.007. Calibrated parameters for the present-day, mean infiltration scenario, used for simulations with perched water conceptual model #3 (non-perching) for the mean infiltration scenarios of the present-day, Monsoon and Glacial transition climates. Submittal date: 3/11/00.

DTN: LB991131233129.001. Modeling calcite deposition and percolation. Submittal date: 3/11/00.

DTN: LB991131233129.002. Modeling seepage and tracer tests at Alcove 1. Submittal date: 3/11/00.

DTN: LB991131233129.003. Analytical and Simulation Results of Chloride and Chlorine-36 Analysis. Submittal date: 3/11/00.

DTN: LB991200DSTTHC.001. Pore water composition and CO2 partial pressure input into THC simulations of the Drift Scale Test and the THC Seepage Model, Table 3 of AMR U0110/N0120. Submittal date: 3/11/00.

DTN: LB991200DSTTHC.002. Model Input and Output Files, Excel Spreadsheets and Resultant Figures which are Presented in AMR N0120/U0110, “Drift-Scale Coupled Processes (Drift-Scale Test and THC Seepage) Models.” Submittal date: 12/15/99.

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DTN: LB991220140160.012. Model Prediction of 3-D Transport, Present-Day Infiltration, #1 Perched Water Model, using EOS9nT Input and Output files. Submittal date: 3/11/00.

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DTN: LB997141233129.001. Calibrated Base-case Infiltration 1-D Parameter Set for the UZ Flow and Transport Model FY99. Submittal date: 07/21/1999.

DTN: MO9901MWDGFM31.000. Geologic Framework Model. Submittal date: 01/06/1999.

DTN: MO9901MWDISMMM.000. Mineralogy Models. Submittal date: 01/22/1999. Submit to RPC.

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